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GB 617910
GB 576728
GB 377264
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B5A

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(54) **Improvement in or relating to apparatus and methods for handling sponge cake material**

(57) Apparatus for forming a piece (20) of sponge cake material into a roll comprises a plurality of laterally spaced conveyors (27) between which are interdigitated toothed rollers (22) which lift the leading edge 40 of the piece. Between and above the rollers (22) are toothed rollers (23) which fold back the leading marginal edge. Means may be provided for varying or maintaining the tension in the conveyors at stages of roll formation and air pressure (42) may be used to urge the material into contact with the conveyors. On completing the roll, rollers are moved out of the conveyor path or the direction of conveyor movement is reversed to remove the completed roll.

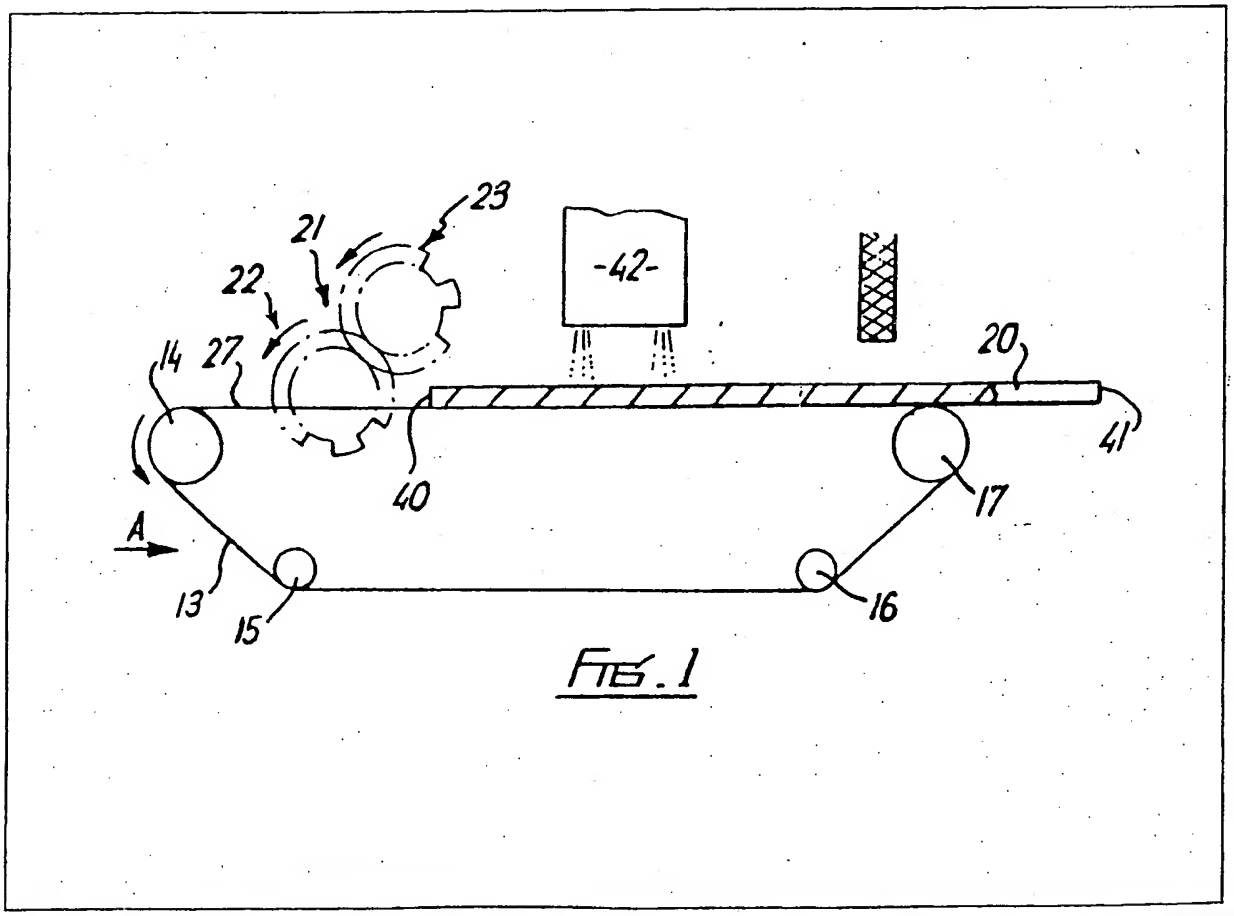

FIG. 1

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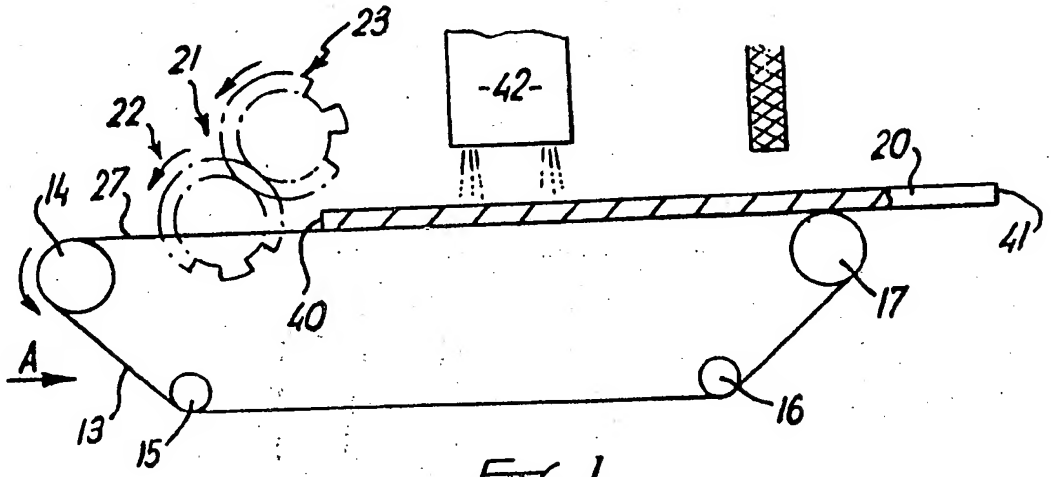

FIG. 1

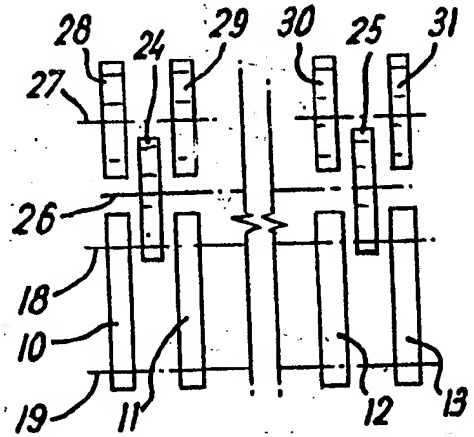

FIG. 1A

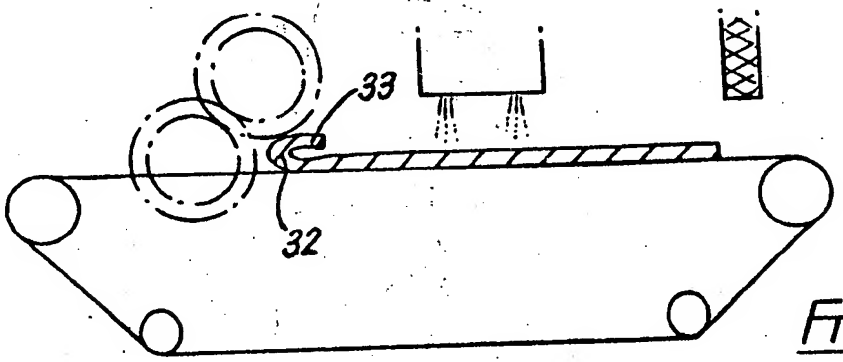

FIG. 2

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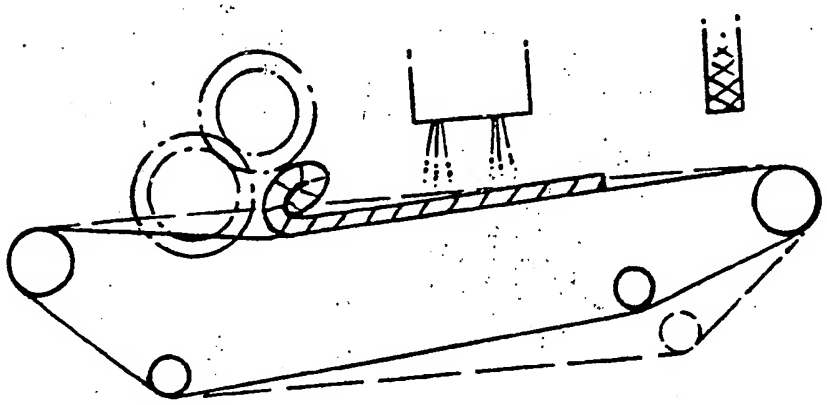
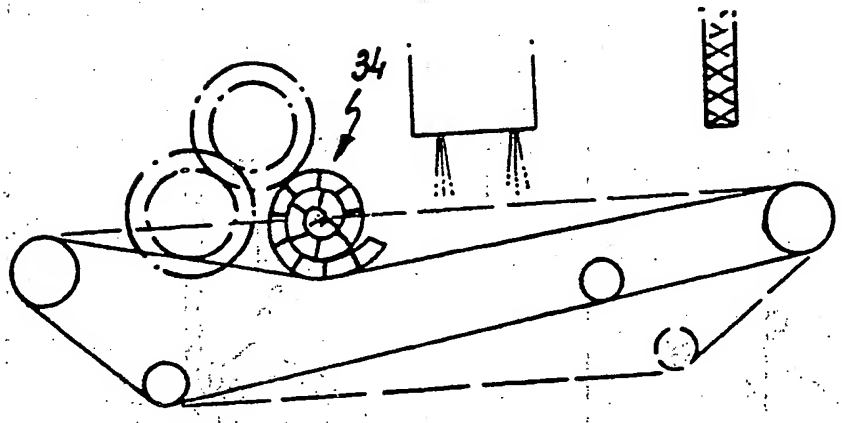


Фиг.3



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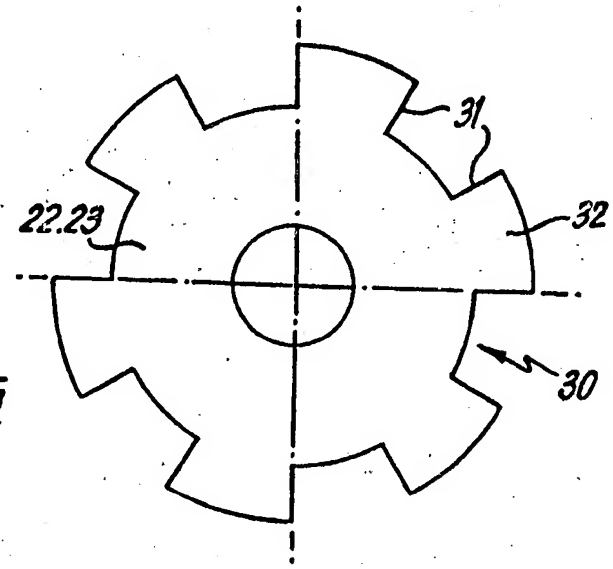
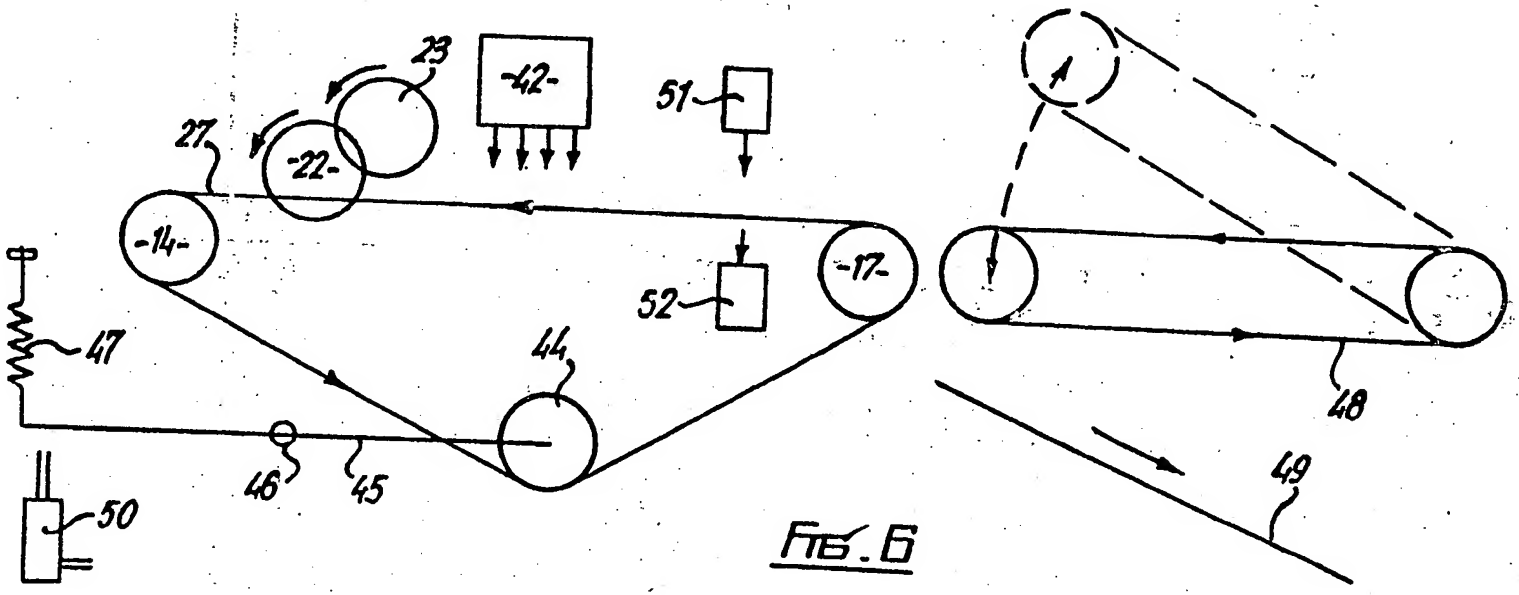


Фиг. 5



Фиг. 6

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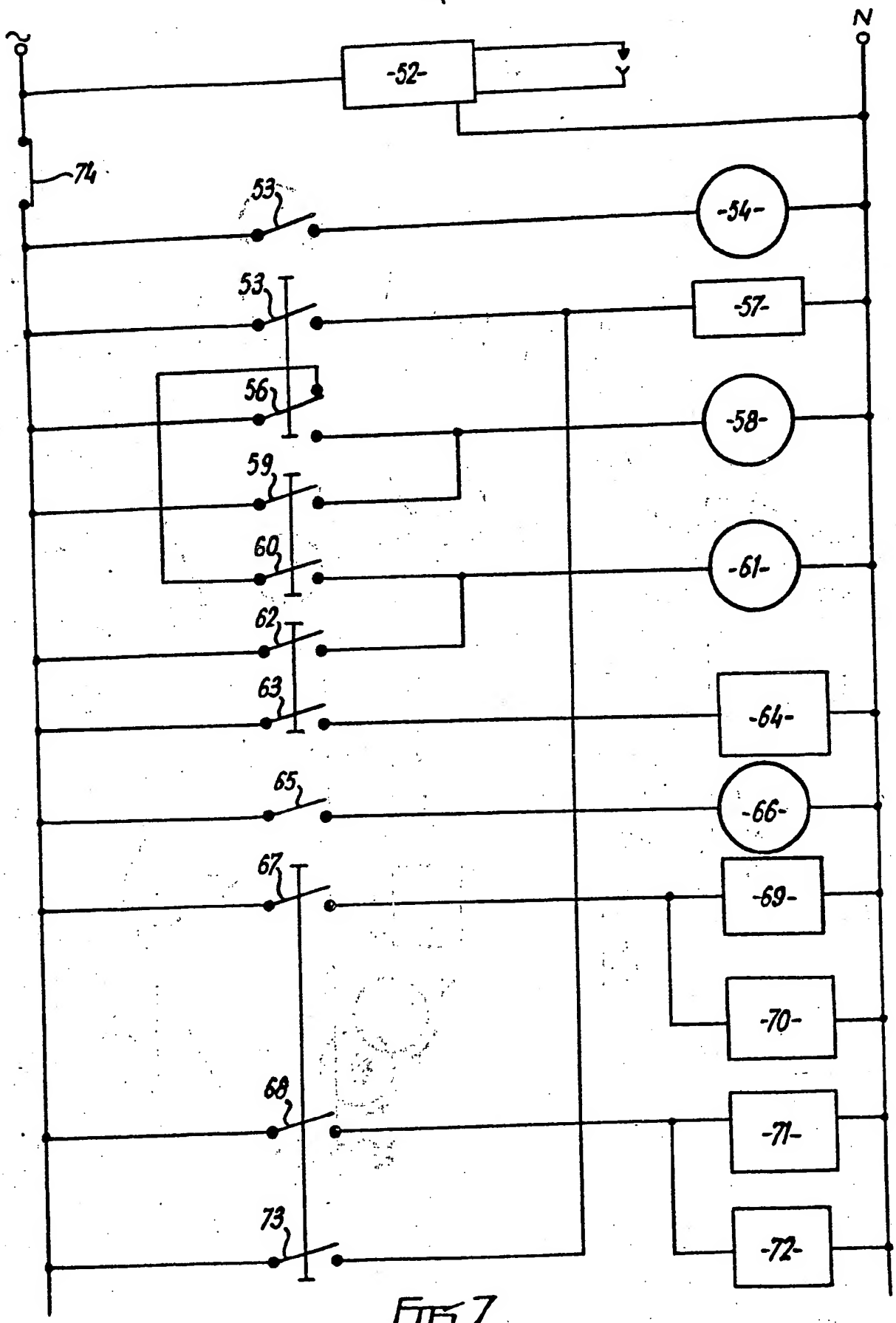


FIG.7

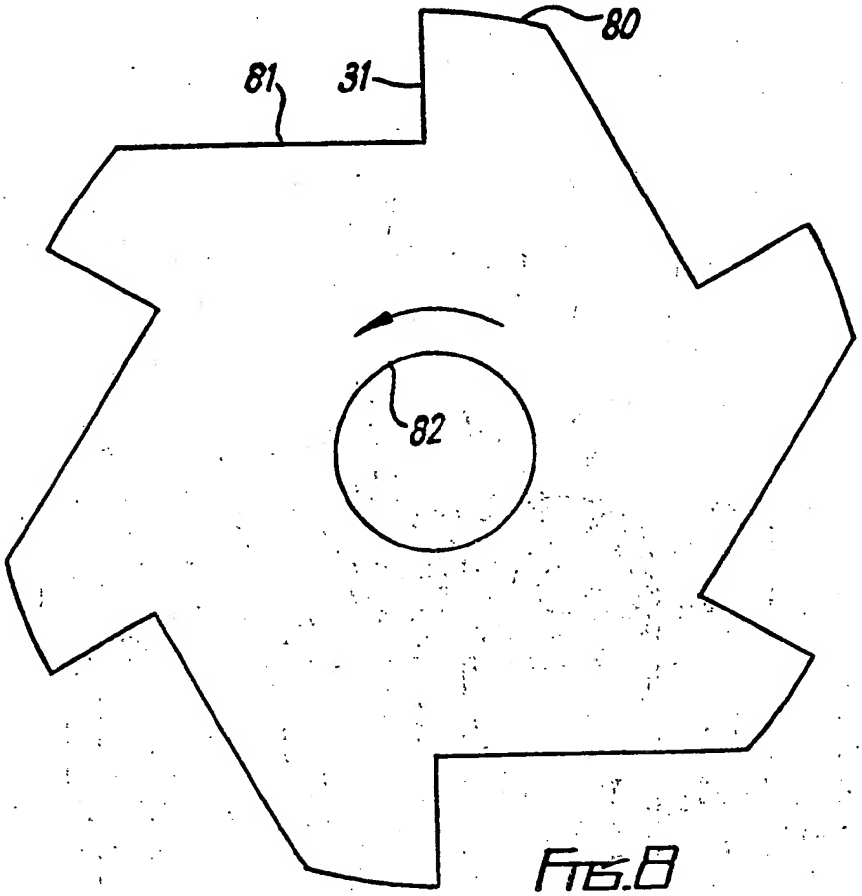


FIG.8

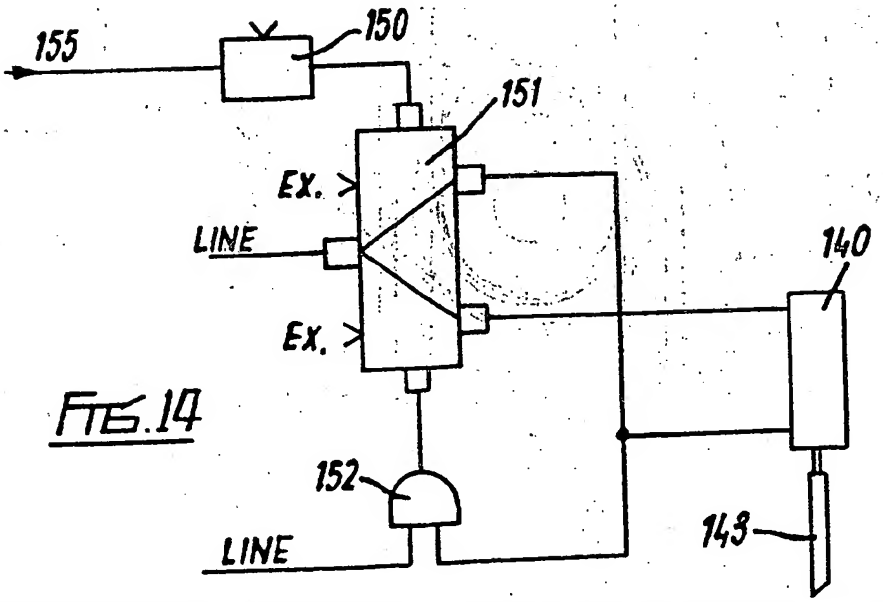
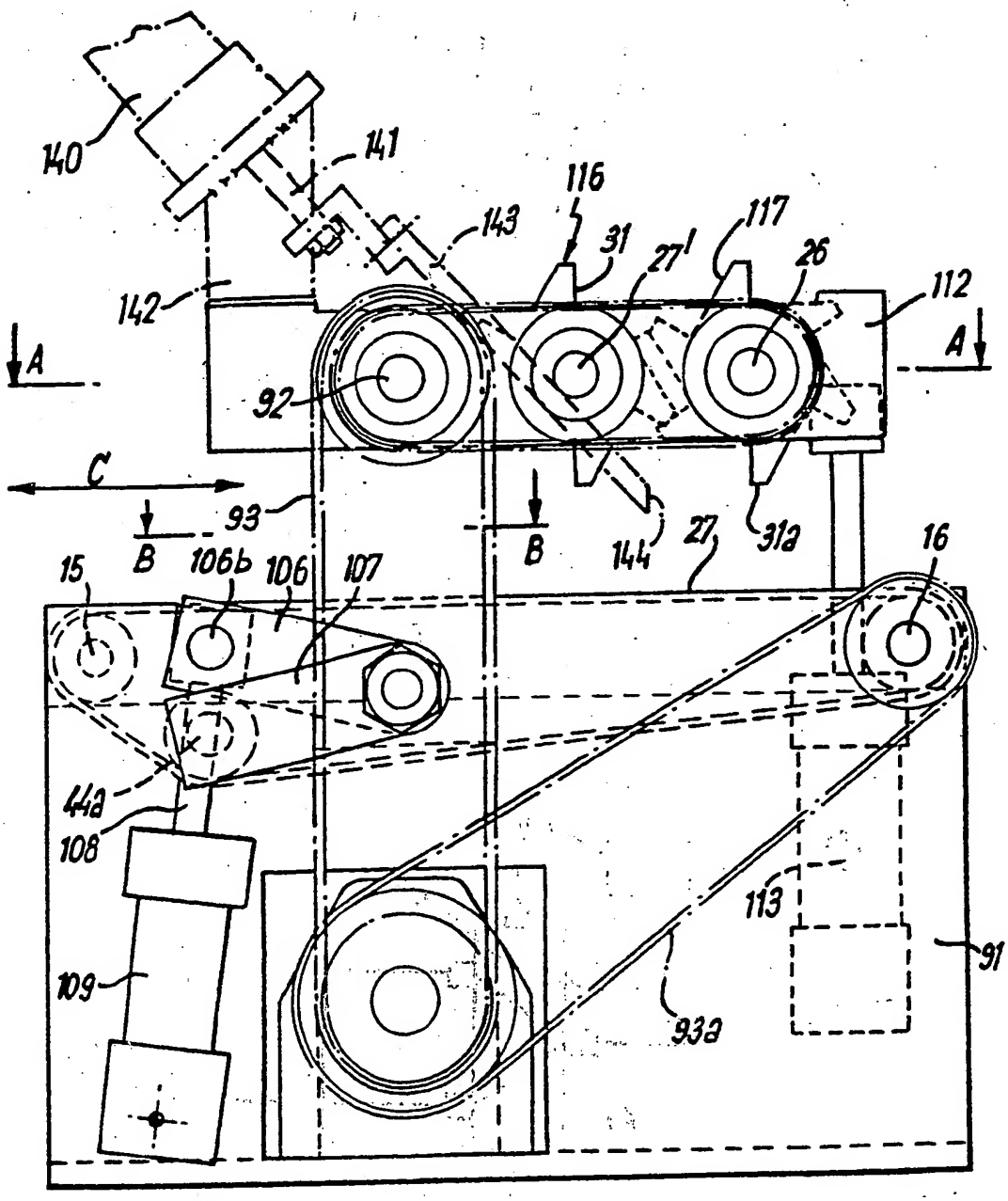
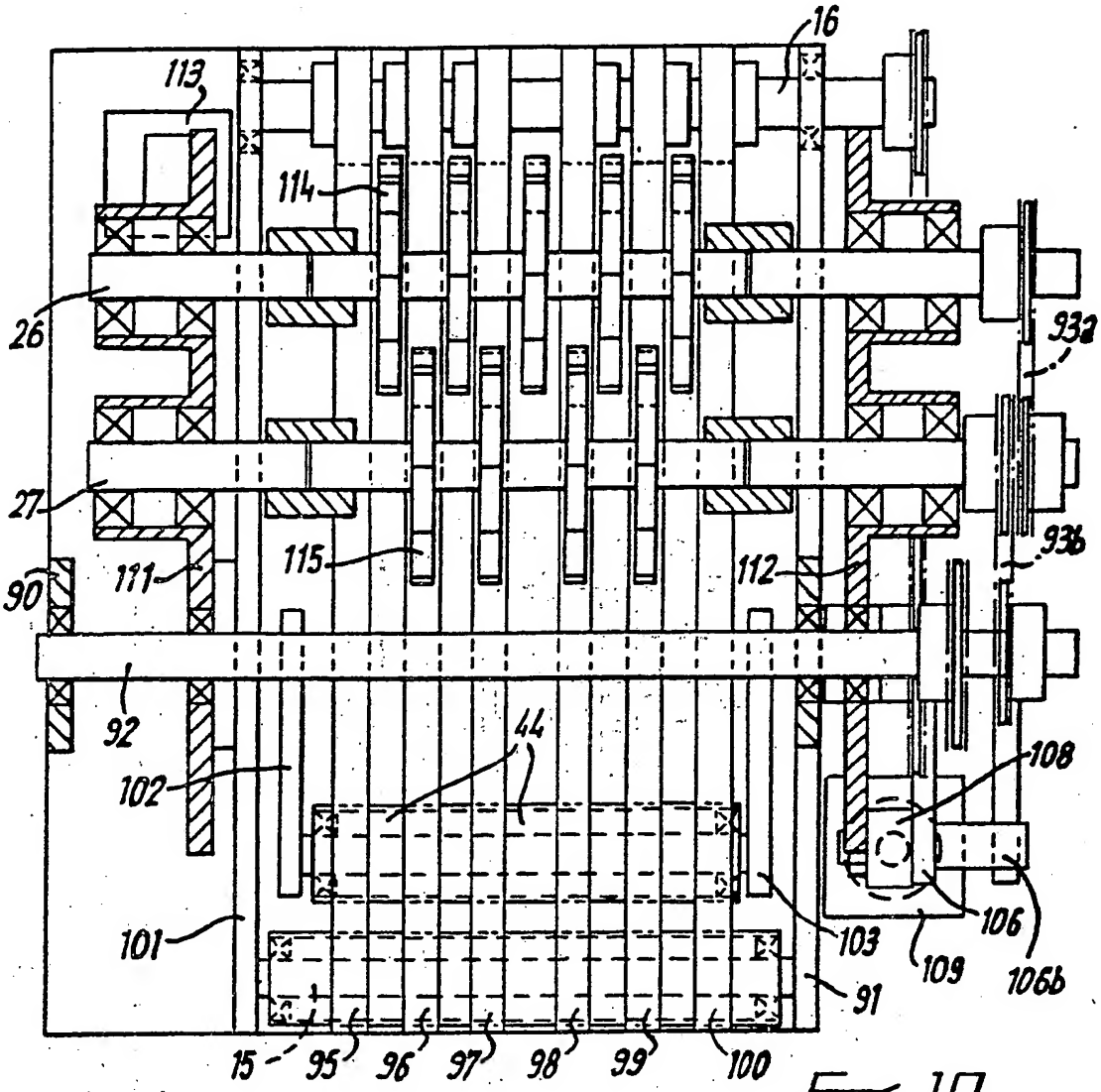


FIG.14


140
141
143
116
31
27'
117
26
112
142
A
A
92
C
93
B
B
144
27
31a
16
15
106b
106
107
44a
108
109
113
91
93a

Фиг.9


16
113
114
26
932
27
115
111
112
90
936
92
44
102
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101
103
106
109
106b
91
15
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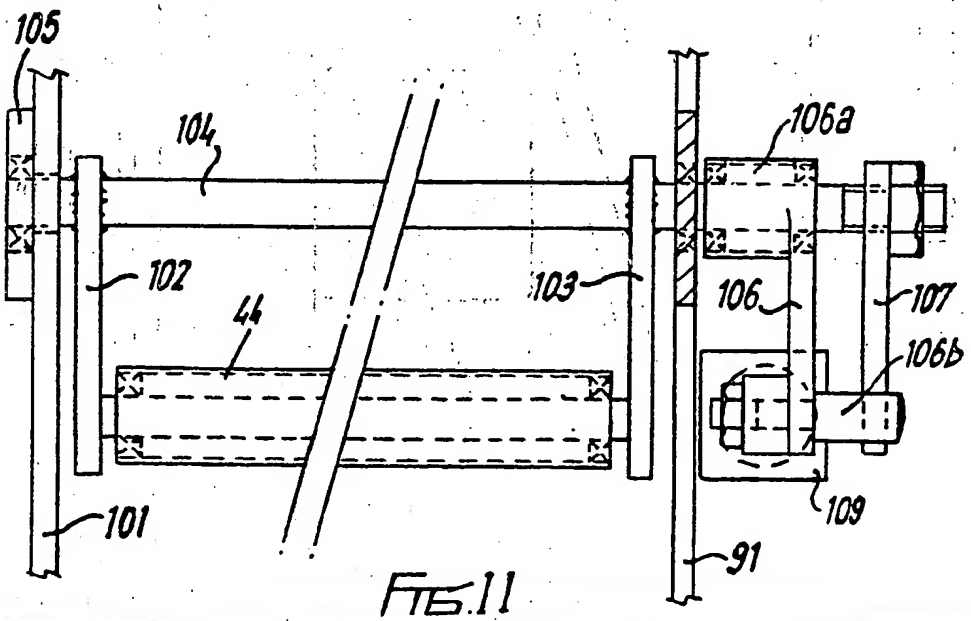
100

ФИГ.10


105
104
106a
102
103
106
107
44
106b
101
109
91

ФИГ.11

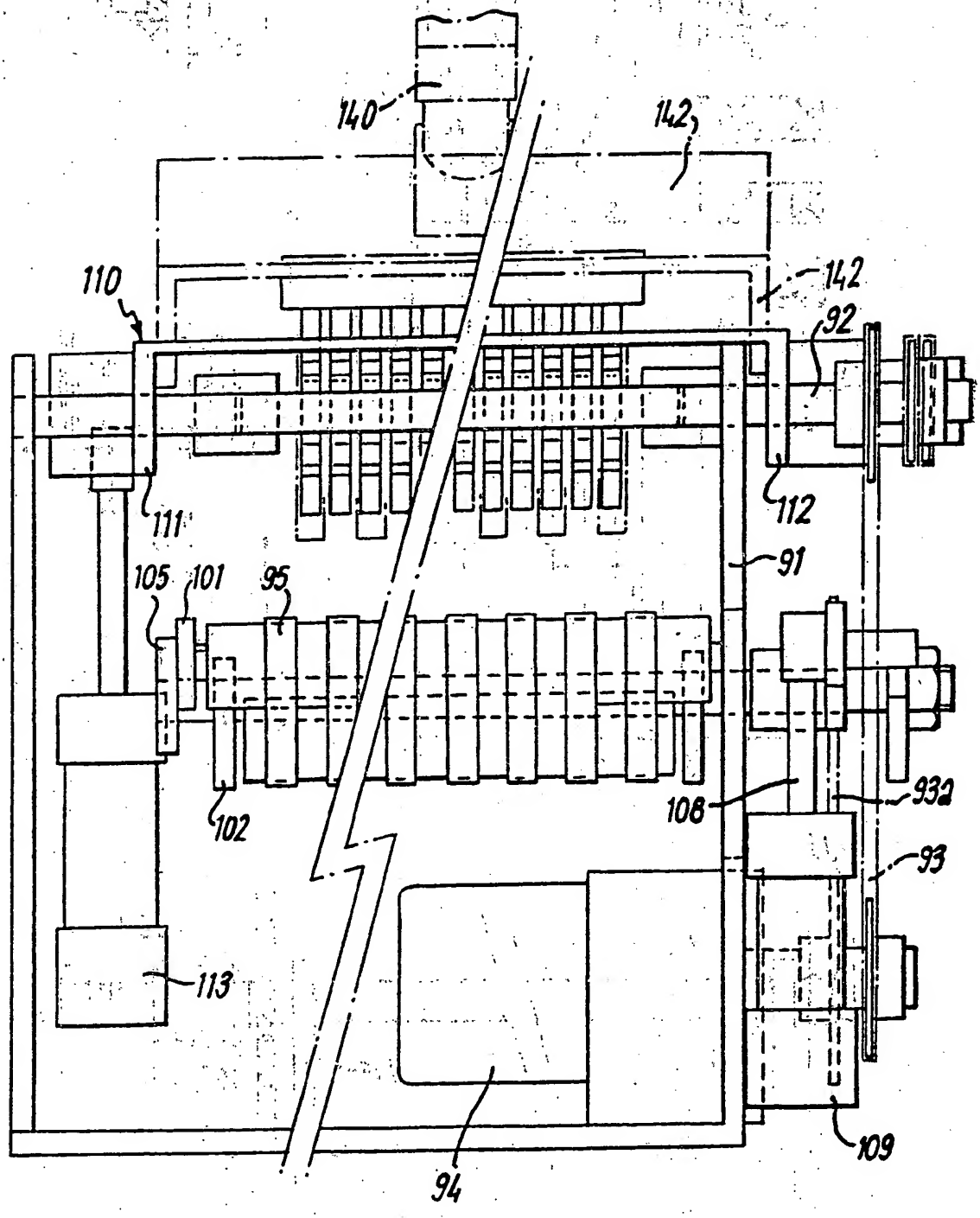


FIG.12

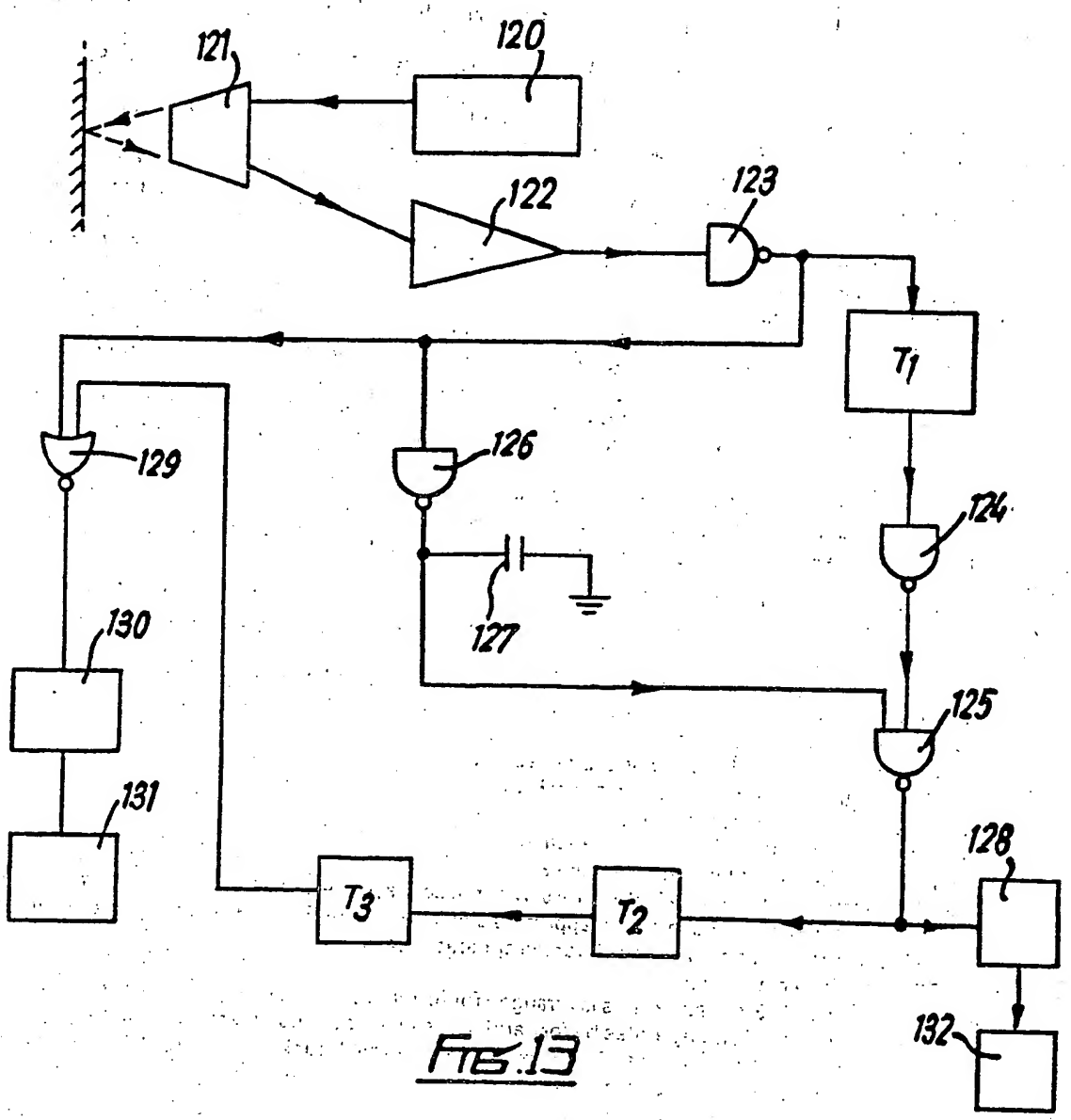


FIG.13

SPECIFICATION

Improvements in or relating to apparatus and methods for handling sponge cake material

This invention relates to apparatus and methods for handling sponge cake material, and in particular to apparatus for forming a piece of material into a roll.

According to one aspect of this invention apparatus for forming a piece of sponge cake material into a roll comprises a plurality of laterally spaced conveyors for carrying the piece in a direction of movement, and rotatable means operative to lift the leading portion of the piece and fold this in the opposite direction to form the piece into a roll.

According to another aspect of the invention a method of forming a piece of sponge cake material into a roll comprises moving the piece in a direction of movement, and engaging the leading edge marginal region sequentially at laterally spaced locations to lift the leading portion of the piece and fold this in the opposite direction to form the piece into a roll.

The apparatus may include means for moving the rotatable means between operative and inoperative positions.

Preferably the rotatable means comprises a first rotatable device located in use between the conveyors for lifting, and a second rotatable device above the conveyors for folding.

The first rotatable device may comprise one or more discs respectively between the conveyors, and the second rotatable device may comprise a plurality of discs respectively between which the disc or discs of the first rotatable device are interdigitated.

The discs may have angularly spaced peripheral teeth for engaging the material. The teeth of adjacent discs may be angularly offset.

The conveyors may be endless.

Means may be provided for varying the tension in the conveyors. Control means may be provided for said tension varying means operative to increase the tension whilst an initial fold is made and thereafter maintain a uniform tension.

Drive means for the conveyors may be adapted to reverse the conveyors when the roll is finished, the control means being operative to increase the conveyor tension during an initial period of reverse movement.

The control means may be responsive to sensor means operative to sense passage of the piece on the conveyors. The sensor means may comprise a photoelectric device.

Means may be provided for urging the piece against the conveyors; for example air under pressure may be used.

The invention may be performed in various ways and three specific embodiments with possible modifications will now be described by way of example with reference to the accompanying drawings, in which:-

Figures 1 to *4* are diagrammatic side views of one apparatus for forming a sponge roll;

Figure 1A is a view of Figure 1 in direction of arrow A;

Figure 5 is a side view of a profiled roller;

Figure 6 is a diagrammatic side view of another apparatus;

Figure 7 is a control circuit for the apparatus of Figure 6;

Figure 8 is a side view of another roller;

Figure 9 is a side view of a further form of apparatus;

Figure 10 is a section on the line A-A of Figure 9;

Figure 11 is a section on the line B-B of Figure 9, with the conveyor belts and other parts omitted for clarity;

Figure 12 is a side view from the left of an apparatus similar to that of Figure 9 but having more conveyors;

Figure 13 is a diagrammatic control circuit for the apparatus of Figures 9 to 12; and

Figure 14 is a further control circuit.

Referring to Figures 1 to 5, the apparatus is arranged for forming a layer of sponge cake material into a roll which is generally cylindrical and operates by forwarding the layer towards rollers which operate to progressively fold back the leading edge of the layer to form the roll. Usually the sponge layer will have one or more superposed layers of confectionery, for example a layer of whipped cream and a layer of jam; these layers will also be folded or rolled with the sponge layer to form a so-called swiss roll.

The apparatus comprises a plurality of parallel, laterally spaced, endless conveyors of which four are shown at 10, 11, 12, 13 in Figure 1A. The number of conveyors can be varied in relation to the width of the sponge layer, that is in relation to the length of the finished sponge roll. The conveyors pass over rollers 14, 15, 16, 17. Rollers 14, 15 are on shafts 18, 19. In some cases the rollers 14, 15, 16, 17 can be common to the conveyors; in other cases the rollers 14, 15, 16, 17 each comprise a plurality of separate rollers respectively associated with the conveyors but mounted for rotation together on a common shaft. One or more of the roller shafts are driven by suitable means (not shown) for example an electric motor.

The conveyors 10-14 may be V-belt type; flat; curved or other shape in cross-section; timing-belt type, for [illegible] construction suitable for

the same type but in some cases there may be different forms of conveyor in the same apparatus.

As can be seen in Figure 1, the conveyors provide upper surfaces 27 arranged to support a layer or piece 20 of sponge cake material and, with the rollers rotating anti-clockwise as indicated by the arrow, to carry the layer 20 towards roller means 21 arranged to fold back the leading edge of the layer. The rotatable roller means 21 comprises a lower series 22 of rollers or discs, of which two are shown in Figure 1A at 24, 25, rotatable on a common shaft 26 and driven by suitable means (not shown) for example an electric motor. The rollers 22 extend below the surface 27 and generally there is one roller 22 between each adjacent pair of conveyors.

The roller means 21 comprises an upper series 23 of rollers or discs, each generally similar to the rollers 22, and it will be seen that the rollers 23 are interdigitated with the rollers 22, and are generally respectively above the conveyors. The rollers 23 rotate on a common shaft 27', driven by suitable means (not shown) for example an electric motor. Four rollers 23 are shown at 28, 29, 30, 31 and it will be seen that they are above the upper stretch 27 of the conveyors.

The discs 22, 23 are profiled. One suitable profile is shown in Figure 5 where the periphery of the disc is formed with a plurality of equiangularly spaced notches 30 of equal angular extent and defined between radial edges 31 and defining between them a plurality of teeth 32 each of equal angular extent to the notches. The discs 22, 23 can be made for example from suitable metals, plastics or wood and are sufficiently rigid to deflect the sponge consistently.

To form a roll, the rollers 14, 22 and 23 are rotated anticlockwise (Figure 1) and the layer 20 placed on the conveyors is carried towards the roller 22, 23. Radial edges 31 of rollers 22 engage beneath the leading edge margin 33 of the layer 20 and lift this above the level 27. The lifted edge is then engaged by the rollers 23 and folded back at 32 (Figure 2). In order to obtain a tight final roll, the initial fold or roll back must be tight against the remainder of the layer. To assist in achieving this, the shaft of rollers 16 is made movable and suitable means (not shown), for example pneumatic, hydraulic, electrical, mechanical or a combination of two or more of these, is used to urge the shaft towards the conveyors to increase the tension in them. This resists any tendency of the upper stretches of the conveyors to move downwards in the region of the roller means 21 during formation of the initial fold in the layer 20.

After the initial fold has been made as shown in Figure 2 the extra tension in the conveyors is released, and as the layer 20 continues to be moved towards the rollers and the diameter of the roll being formed increases, the tension in the conveyors is maintained constant by moving the roller 16 progressively towards the full line position of Figure 3. The rollers 22 continue to lift and fold and the rollers 23 to fold the leading edge region of that part of the layer 20 on the conveyor stretch 27. As the diameter of the roll 34 increases the roller 16 is steadily moved to maintain constant the conveyor tension and to allow the upper conveyor stretches 27 to move downwardly to accommodate the increasing diameter of the roll. The condition when the roll is finished is shown in Figure 4.

It will be appreciated that, alternatively or additionally, the roller 15 could be moved to control the tension in the endless conveyors.

When the roll 34 is finished the rollers 22, 23 continue to rotate anti-clockwise or are stopped; the conveyor rollers are driven clockwise to move the roll away from the roller means 21. The roll can be removed by hand or carried rearwards by the conveyors to a delivery chute. The conveyors are then driven forwards (rollers 14 going anti-clockwise) with roller means 21 going anti-clockwise and another layer 20 can be placed, by hand or delivery machine, on the conveyors to make another roll.

In an alternative arrangement, when the roll 34 is finished, the conveyors continue to move forwards but the roller means 21 are moved upwards away from the conveyors to allow the roll 34 to be carried beneath them to a discharge chute. The roller means 21 can then be lowered back to their operative positions ready for the next layer 20.

When the finished roll 34 has been removed the roll 16 returns to the full line position of Figure 2 ready for the next layer or piece 20.

The sponge material is extruded as a continuous length from a conventional machine onto a conveyor and is cut transversely at spaced locations to provide individual pieces 20. The pieces 20 are turned through 90° before being placed on the conveyors so that the leading and trailing edges 40, 41 of the pieces 20 were the side edges of the material leaving the extruder.

When the roll 34 is finished, its weight may cause the conveyors to deflect even when roll 16 has returned to its Figure 2 position, and this may lead to the roll staying in position on the conveyors and rotating on its axis rather than being carried forwards or rearwards to a delivery chute. If necessary, the conveyors can be placed again under increased tension in the manner described above, to avoid this occurring.

The application of higher and lower conveyor tension may be under the control of sensors and timers as described below.

To assist in repeatedly forming a tight roll, the positive drive connection between the layer 20 and the conveyors can be assisted by a downward pressure on the layer 20. This could be a mechanical pressure, or as a pneumatic pressure as shown in the drawings where an air pressure unit or fan 42 delivers a downwards discharge of air under pressure onto the layer 20. This resists any tendency for relative sliding movement

connected at its other end to an adjustable tension spring 47. A layer delivery conveyor 48 is movable between delivery (full line) position and discharge (dotted) position. An ejection or delivery chute 49 is provided.

A piston and cylinder device 50 is arranged to act on arm 45 to compress spring 47 to increase the tension in the conveyors at selected times.

A light source 51 and photocell 52 provide a sensing device. A cycle is started by a piece 20 interrupting the light beam from source 51 causing contacts 53 in the photocell unit 52 to make energising relay 54 causing relay contacts 55, 56 to close. This energises a belt tension solenoid 57 which energises piston and cylinder device 50 to pivot arm 46 to apply tension to the conveyors. The position of the parts in relation to the length of the piece 20 is such that when the rear edge of the piece 20 passes beneath source 51, thus restoring the light to the cell 52, a first turn of the sponge (Figure 2) is completed.

The closing of contacts 56 actuates relay 58 which in turn closes contacts 59, 60. This puts a hold condition on relay 58 via contact 59. When the piece 20 has passed the light beam, contact 55 opens, de-energising solenoid 57 and releasing the applied tension on the conveyors; and because contact 60 is closed and contact 56 is opened, relay 61 is energised which in turn closes contacts 62, 63. This puts a hold condition on relay 61 via contact 62, and delay timer 64 is started through contact 63. The timer 64 is set to operate when the roll 34 is finished to close contact 65 to energise relay 66 which closes contacts 67, 68. Closing of contact 67 energises forward/reverse solenoid 69 to cause the conveyors to move rearwards, and actuates a control mechanism 70 for lifting the feed conveyor 48 to the up, inoperative, position.

Delay timers 71, 72 are energised together through contact 68; timer 71 is set to close contact 73 to re-apply tension to the conveyors through device 50 when the completed roll 34 has moved clear of the roller means 21. The timer 72 is set to operate when the completed roll 34 is on the ejection chute 49 to open contacts 74 to de-energise the control circuit, returning the control circuit to the condition shown in Figure 7 and bringing the apparatus to a condition ready to receive the next piece 20.

Instead of mechanical relays, the control circuit could include solid state or pneumatic logic components or combinations of these three.

The sensor instead of using a photocell could use ultrasonics or pneumatics.

In a modified arrangement, instead of the sensor and timers being arranged to initiate and control the period of higher tension in response to passage of the sponge piece, they may be arranged to initiate and control the period of lower tension in response to the rolling of the piece. Additional sensors near the roller means may be required. Figure 8 shows a preferred form of roller or disc in which the outer edges 80 of the teeth, as in Figure 5, lie on a common circle but the trailing edges 81 of the teeth are not radial but extend part-way along a chord. This resists any tendency of the leading edge of the piece, which can tend to be somewhat crisper than the centre, to catch in the gap behind the edge which lifts it. A central aperture 82 enables the disc to be mounted on the shaft.

In one arrangement the conveyors are each 0.953 cm wide and the discs 22, 23 are also 0.953 cm wide and the discs and conveyors are as close together as practicable. The radial extent of edge 31 may for example be 0.79 cm and the diameter of the circle defining the edges 80 may be 5.72 cm.

In one arrangement two pieces 20 are fed at a time side-by-side on to the conveyor surfaces 27 so that two rolls 34 are formed simultaneously.

It will be appreciated that as the roll is being formed the spring 47 will yield allowing roller 44 to move to allow the upper stretch 27 of the conveyors to accommodate the roll; roller 16 could be similarly supported on a spring-biassed arm.

Independently of the higher tension applied as above, the tension in the conveyors can be initially adjusted, by adjusting the initial condition or rating of the spring 47; this is useful depending on whether the apparatus is to be used with pieces having no, one or several superposed layers of confectionery.

In the arrangement shown in Figures 9 to 13, in which like parts to the other Figures have to be referenced, a sturdy frame comprises parallel side plates 90, 91 supporting shaft 92 in bearing. The shaft 92 is rotated by electric motor 94 through transmission claim 93 extending round suitable gears. The motor 94 drives shaft 16 through chain 93*a*. Six laterally spaced endless conveyors 95-100 extend round sleeves 15*a*, 16*a* rotatable on but axially fixed in relation to shafts 15, 16 which can rotate in frame members 91, 101. Conveyors 97, 98 have a greater lateral separation than between conveyors 95, 96 or 96, 97 or 98, 99 or 99, 100. Sleeve 44 is rotatable on but axially fixed in relation to shaft 44*a* carried between link members 102, 103 which are pivoted on a shaft 104 Figure 11 which can rotate in side member 91 and extends through member 101 and is rotatable in a member 105 fixed to the member 101.

A link member 106 is pivoted at one end 106*a* on shaft 104 outside member 91 and at the other end is connected by a sliding pivot to a piston 108 of a pneumatic piston and cylinder 109. The link 106 carries a projection 106*b* which, on downward movement of the piston from the position shown in Figure 9 engages a link 107 fixed to the shaft 104 so that downward movement of the piston causes the roller 44 to engage the conveyor belts more firmly to increase the tension in the conveyor belts.

A sub-frame 110 having parallel depending side plates 111, 112 rotatably receives shaft 92 and can be pivoted about this shaft by pneumatic piston and cylinder 113.

rotate in bearings in members 111, 112. In the discharge or inoperative position shown in Figure 9, the rollers 114, 115 are spaced above upper conveyor surfaces 27. On operation of cylinder 113, the plates 111, 112 are pivoted clockwise as seen in Figure 9 to bring the rollers 114 to a position interdigitated with the conveyors 96-100, similar to Figures 1 and 6 but it will be appreciated that in the arrangement of Figure 9 the sponge pieces 20 travel from left to right and the rollers 114, 115 rotate clockwise as seen in Figure 9. As can be seen in Figure 9, the profile of roller discs 114, 115 includes six teeth 116 each having radial face 31 for engaging the sponge piece 20 an arcuate tip 31*a* and a trailing base 117 which is a chord and leads to the inner end of the next adjacent face 31. Transmission chains 93*b*, 93*c* cooperable with gears rotate shaft 27' from shaft 92 and shaft 26 from shaft 27'.

Referring to Figure 13, a square wave generator 120 supplies an infra-red reflective head 121 which sends a signal through an I.C. amplifier 122 to NOT gate 123 which signals rolling timer T1 whose output goes to NOT gate 124 whose output goes to NAND gate 125. The signal from gate 123 goes also to NOT gate 126 whose output goes to gate 125. The output of gate 126 goes to zero volts through capacitor 127. The output of gate 125 goes to opto-triac 128 connected to eject solenoid 132. The output of gate 125 goes to belts tightener delay timer T2 connected to belts tight timer T3 connected to NOR gate 129 which also receives the output of gate 123. The output of gate 129 goes to opto-triac 130 connected to belt tension solenoid 131.

The operation of the control circuit is indicated as follows:-

Condition	Programme	Photo-Electric	Belts	Rollers Down(Roll) Up (Eject)	T1	T2	T3
1	Start	Dark 1	Slack 1	Up 0			
2	Sponge Approaches	Light 0	Tight 0	Down 1			
3	Sponge 1st turn complete	Dark 1	Slack 1	Down 1	Starts		
4	Roll completed in T1	Dark 1	Slack 1	Up 0	Finish	Starts	
5	During T2	Dark 1	Slack 1	Up 0		Finish	Starts
6	After T2 During T3	Dark 1	Tight 0	Up 0			Finish
7	After T3	Dark 1	Slack 1	Up 0			

The logic condition 0 or 1 is indicated. In regard to the timers, the output of T1, T2 and T3 normally is at logic 0; the input is normally at logic 1. A momentary change of input from 1 to 0 initiates the relevant timing period. At the start of the timing period the output changes to logic 1 and remains at 1 until the end of the timing period at which it returns to logic 0. An input change from logic 0 to logic 1 has no effect on the timers.

The solenoids 131, 132 control pneumatic valves controlling the pneumatic cylinders 109 and 113. When solenoid 131 is de-energized the conveyor belts are tight (roller 44 down), when energized roller 44 is up. When solenoid 129 is energized the profiled rollers 114, 115 are in the eject, up, position shown in Figure 9; when deenergized the rollers are in the operative, down, position.

The logic condition at the start of a cycle (no sponge piece 20):

Item 122	Output 1	
123 Input 1	Output 0	
T1 Input 0	Output 0	Not timing
126 Input 0	Output 1	
124 Input 0	Output 1	
125 Two 1 Inputs	Output 0	
128 Input 0	Output 0	
132 Input 0	De-energized	Eject up
T2 Input 0	Output 0	Not timing
T3 Input 0	Output 0	Not timing
129 Two 0 Inputs	Output 1	
130 Input 1	Output 1	
131 Input 1	Energized	Belts slack

When a sponge piece 20 approaches and the photo device 121 detects its presence, the output from amplifier 122 changes to 0 which in turn changes the output from gate 123 to 1. Because gate 126 output changes to 0, gate 125 output changes to 1, so that the output from opto-triac 128 energises solenoid 132, thus bringing the profiled rollers down. At the same time gate 129 output changes to 0 causing opto-triac 130 to de-energise the solenoid 131 causing the belts to tighten. T1, T2 and T3 do not start to time.

When the sponge piece has passed under the photo-device 121 so that the device no longer senses the presence of a piece 20 output from 122 changes to 1 and from gate 123 to 0 T1 starts to time causing its output to go to logic 1 and the output of gate 124 to go to logic 0. At the same time the output of 126 changes to 1. (It is possible that due to propagation delays in T1 and gate 124 both inputs to 125 could have a logic 1 present for a short period of time which could cause a premature change in output of 125 - i.e. before T1 has timed. Therefore, the change in output from from 126 is delayed until after 124 output has gone to 0 by the introduction of capacitor 127. There is then no change in output of 125 so 128, 132, T2 and T3 remain the same until T1 (rolling timer) has completed its timing. Also, when 123 changed to 0 (i.e. start of timer T1) the output of 129 changes to 1 causing 130 to energise solenoid 131 thus causing the belts to go slack. When timer T1 has completed, its output goes to 0 causing output of 125 to go to 0 making 128 energise solenoid 132 and profiled rollers (eject) to go up. Also when the output of 125 goes to 0 T2 starts and its output goes to 1 for the duration of T2 (the purpose of T2 is to allow the rollers fully to go up before the belts tighten). When T2 completes its timing period its output goes to 0 causing T3 to start and its output to go to 1, so that gate 129 changes to 0 causing 130 to de-energise the solenoid 131 and the belts tighten (for duration of T3). When T3 times out, its output goes to 0 making the output of gate 129 go to 1 causing opto-triac 130 to energise the solenoid 131 and the belts to go slack, thus completing the full cycle and returning to the start condition.

During the period timed by timer T3 the completed roll is carried forwards to a discharge chute, not shown. The conveyors continue forwards movement under the control of a main start/stop switch.

The photo-electric device 121 is mounted at the infeed end region of the conveyors and is adjustable parallel to the belts, for example as indicated at C in Figure 9. The length of a sponge piece 20 can vary, for example between 10 cms and 30 cms in making rolls of different sizes, and the position of the device 121 is determined by the length of sponge piece 20 to be rolled. The position is adjusted so that when the first turn or fold has been completed the device 121 stops sensing the piece 20, i.e. the trailing edge 41 is just no longer sensed. The device 121 is about 1.9 cms above the piece 20.

In a modification shown dotted, means are provided for helping to tuck in tight the first turn or fold. A pneumatic cylinder and piston 140, 141 is supported on bracket 142 secured to member 112 and is connected to prong device 143 having tip 144. The cylinder 140 receives its operating signal from the belt slack cylinder

stroke. Rolling of the piece is not interrupted. The device 143 comprises a plurality of laterally spaced prongs located between adjacent rollers 115. A suitable control circuit is shown in Figure 14 in which a signal 155 to impulse valve 150 from the belts slack cylinder 109 causes spool valve 151 to change over and extend the prong cylinder 140 and as soon as the pressure drops on the other side of the cylinder 140 NOT valve 152 changes the spool valve 151 back again causing the prongs 143 to retract immediately.

It will be understood that the sponge pieces 20 are rectangular or square and may be from, for example, 0.95 cm to 1.25 cm in height. The edges or edge margins 40, 41, on energising from the oven in which the sponge batter is cooked, are often crisper than the remainder, and can approximate to a biscuit consistency. These margins may be up to 1.25 cm in length and soften again after the roll is completed.

Instead of the light spring 47, a system of counterweights could be used on beam 45 to control the belt tension.

It will be understood that the tension controlling means is self-adjusting to accommodate the increasing diameter of the roll being formed, and the varying possible sponge piece thickness.

The tension in the belts can be adjusted. Thus the belt tension can be increased by increasing the pressure in the double acting cylinder 109. Instead of the rollers 114 (or rollers 115) being axially aligned, as shown in Figure 9, they could be angularly offset so that instead of operative edges 31 engaging the piece 20 simultaneously, edges 31 of different discs 114 could engage the piece at different times. For example alternate discs 114 and/or 115 could be equi-angularly offset in the same sense in relation to the remainder so that the edges 31 of the offset discs engage the leading edge together and the edges 31 of the remainder engage the piece together. Other forms of offsetting are possible; for example rollers 114 and/or 115 could engage the piece repeatedly in axial sequence. For this purpose the rollers are connected to the respective shaft by grub screws permitting angular adjustment of the respective discs. The teeth engage the leading edge marginal portion of the piece 20 sequentially at laterally spaced locations.

It will be understood that the peripheral speed of the toothed discs is generally matched with or equal to the linear speed of the conveyors.

The number of teeth on the discs could be less than or more than six.

CLAIMS

1. Apparatus for forming a piece of sponge cake material into a roll comprising a plurality of laterally spaced conveyors for carrying the piece in a direction of movement, and rotatable means operative to lift the leading portion of the piece and fold this in the opposite direction to form the piece into a roll.

2. Apparatus as claimed in Claim 1, including means for moving the rotatable means between operative and inoperative positions.

3. Apparatus as claimed in Claim 1 or Claim 2, in which the rotatable means comprises a first rotatable device located in use between the conveyors for lifting, and a second rotatable device above the conveyors for folding.

4. Apparatus as claimed in Claim 3, in which the first rotatable device comprises one or more discs respectively between the conveyors.

5. Apparatus as claimed in Claim 3 or Claim 4, in which the second rotatable device comprises a plurality of discs respectively between which the disc or discs of the first rotatable device are interdigitated.

6. Apparatus as claimed in Claim 4 or Claim 5, in which the discs have angularly spaced peripheral teeth for engaging the material.

7. Apparatus as claimed in Claim 6, in which the teeth have radial edges for engaging the material.

8. Apparatus as claimed in any of Claims 3 to 7, in which the first and/or second rotatable devices comprise axially spaced angularly offset elements for engaging the piece.

9. Apparatus as claimed in Claim 6 or Claim 7, in which the teeth of adjacent discs are angularly offset.

10. Apparatus as claimed in any preceding claim, in which the conveyors are endless.

11. Apparatus as claimed in any preceding claim, including means for varying the tension in the conveyors.

12. Apparatus as claimed in Claim 11, including control means for said tension varying means operative to increase the tension whilst an initial fold is made and thereafter maintain a uniform tension.

13. Apparatus as claimed in Claim 11 or Claim 12, including drive means for the conveyors adapted to reverse the conveyors when the roll is finished, the control means being operative to increase the conveyor tension during an initial period of reverse movement.

14. Apparatus as claimed in Claim 12 or Claim 13, in which the control means is responsive to sensor means operative to sense passage of the piece on the conveyors.

15. Apparatus as claimed in Claim 14, in which the sensor means comprises a photoelectric device.

16. Apparatus as claimed in any preceding claim, including means for urging the piece against the conveyors.

17. Apparatus as claimed in Claim 16, in which the urging means comprises means for supplying air under pressure.

[illegible] engageable with the leading

20. Apparatus for forming a piece of sponge cake material into a roll substantially as hereinbefore described with reference to and as illustrated in Figures 1 to 5, or Figures 6 and 7, or Figure 8, or Figures 9 to 13, or Figure 14 of the accompanying drawings.

21. A method of forming a piece of sponge cake material into a roll comprising moving the piece in a direction of movement, and engaging the leading edge marginal region sequentially at laterally spaced locations to lift the leading portion of the piece and fold this in the opposite direction to form the piece into a roll.

22. A method of forming a piece of sponge cake material into a roll as claimed in Claim 21 and substantially as hereinbefore described.

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